Agency for Healthcare Research and Quality
Advancing Excellence in Health Care

NATIONAL QUALITY MEASURES CLEARINGHOUSE

General

Title

Stroke: hospital 30-day, all-cause, risk-standardized mortality rate (RMSR) following ischemic stroke hospitalization.

Source(s)

Yale New Haven Health Services Corporation (YNHHSC), Center for Outcomes Research and Evaluation (CORE). 2017 condition-specific measures updates and specifications report: hospital-level 30-day risk-standardized mortality measures. Baltimore (MD): Centers for Medicare & Medicaid Services (CMS); 2017 Mar. 98 p. [29 references]

Measure Domain

Primary Measure Domain

Clinical Quality Measures: Outcome

Secondary Measure Domain

Does not apply to this measure

Brief Abstract

Description

This measure estimates a hospital-level, 30-day risk-standardized mortality rate (RSMR) for patients discharged from the hospital with a principal diagnosis of ischemic stroke. Mortality is defined as death from any cause within 30 days of the start of the index admission.

The Centers for Medicare & Medicaid Services (CMS) annually reports the measure for individuals who are 65 years and older and are Medicare Fee-for-Service (FFS) beneficiaries hospitalized in non-federal short-term acute care hospitals (including Indian Health Services hospitals) and critical access hospitals.

Rationale

The goal of this measure is to improve patient outcomes by providing patients, physicians, and hospitals with information about hospital-level, risk-standardized mortality rates following hospitalization for acute

ischemic stroke. Measurement of patient outcomes allows for a broad view of quality of care that encompasses more than what can be captured by individual process-of-care measures. Complex and critical aspects of care, such as communication between providers, prevention of, and response to, complications, patient safety and coordinated transitions to the outpatient environment, all contribute to patient outcomes but are difficult to measure by individual process measures (Krumholz et al., 2007; Bradley et al., 2006). The goal of outcomes measurement is to risk-adjust for patients' conditions at the time of hospital admission and then evaluate patient outcomes. This mortality measure was developed to identify institutions whose performance is better or worse than would be expected based on their patient case-mix, and therefore promote hospital quality improvement and better inform consumers about care quality.

Stroke can be a sudden and devastating disease and, in a small proportion of cases, may result in patients being so disabled and debilitated that they and their families elect to not continue aggressive treatment. In such cases the best quality care may ultimately be that which supports patients' goals and comfort at the end of life rather than that which prolongs life. The intent of a mortality rate is not to convey that all deaths are the result of poor care. The goal is not to have zero deaths. The premise is that there are preventable deaths. Knowledge of how an institution performs compared with what might be expected given their case mix is helpful in encouraging efforts to improve outcomes.

Evidence for Rationale

Bradley EH, Herrin J, Elbel B, McNamara RL, Magid DJ, Nallamothu BK, Wang Y, Normand SL, Spertus JA, Krumholz HM. Hospital quality for acute myocardial infarction: correlation among process measures and relationship with short-term mortality. JAMA. 2006 Jul 5;296(1):72-8. PubMed

Krumholz HM, Normand SL, Spertus JA, Shahian DM, Bradley EH. Measuring performance for treating heart attacks and heart failure: the case for outcomes measurement. Health Aff (Millwood). 2007 Jan-Feb;26(1):75-85. PubMed

Yale New Haven Health Services Corporation (YNHHSC), Center for Outcomes Research & Evaluation (CORE). Hospital 30-day mortality following acute ischemic stroke hospitalization measure: methodology report. Baltimore (MD): Centers for Medicare & Medicaid Services (CMS); 2010 Sep 29. 50 p. [17 references]

Primary Health Components

Ischemic stroke; 30-day mortality rate

Denominator Description

The measure cohort consists of admissions for Medicare Fee-for-Service (FFS) beneficiaries aged 65 years or older and discharged from non-federal acute care hospitals and critical access hospitals, having a principal discharge diagnosis of ischemic stroke.

The risk-standardized mortality rate (RSMR) is calculated as the ratio of the number of "predicted" deaths to the number of "expected" deaths at a given hospital, multiplied by the national observed mortality rate. For each hospital, the denominator is the number of deaths expected based on the nation's performance with that hospital's case mix.

See the related "Denominator Inclusions/Exclusions" field.

Note: This outcome measure does not have a traditional numerator and denominator like a core process measure; thus, this field is used to define the measure cohort.

See the *2017 Condition-specific Measures Updates and Specifications Report. Hospital-level 30-day Risk-standardized Mortality Measures* for more details.

Numerator Description

The measure counts death from any cause within 30 days of the start of the index admission.

The risk-standardized mortality rate (RSMR) is calculated as the ratio of the number of "predicted" deaths to the number of "expected" deaths at a given hospital, multiplied by the national observed mortality rate. For each hospital, the numerator of the ratio is the number of deaths within 30 days predicted based on the hospital's performance with its observed case mix.

Note: This outcome measure does not have a traditional numerator and denominator like a core process measure; thus, this field is used to define the outcome.

See the *2017 Condition-specific Measures Updates and Specifications Report. Hospital-level 30-day Risk-standardized Mortality Measures* for more details.

Evidence Supporting the Measure

Type of Evidence Supporting the Criterion of Quality for the Measure

One or more research studies published in a National Library of Medicine (NLM) indexed, peer-reviewed journal

Additional Information Supporting Need for the Measure

Stroke is the fifth most common cause of death, affecting approximately 795,000 people in the United States annually, and has a mortality rate of 17% (Go et al., 2014; Kochanek et al., 2014). Stroke is also a leading cause of disability in the United States, which can lead to increased dependency on the health care system and higher subsequent costs associated with this care (Centers for Disease Control and Prevention [CDC], 2009).

Evidence for Additional Information Supporting Need for the Measure

Centers for Disease Control and Prevention (CDC). Prevalence and most common causes of disability among adults--United States, 2005. MMWR Morb Mortal Wkly Rep. 2009 May 1;58(16):421-6. PubMed

Go AS, Mozaffarian D, Roger VL, Benjamin EJ, Berry JD, Blaha MJ, Dai S, Ford ES, Fox CS, Franco S, Fullerton HJ, Gillespie C, Hailpern SM, Heit JA, Howard VJ, Huffman MD, Judd SE, Kissela BM, Kittner SJ, Lackland DT, Lichtman JH, Lisabeth LD, Mackey RH, Magid DJ, Marcus GM, Marelli A, Matchar DB, McGuire DK, Mohler ER, Moy CS, Mussolino ME, Neumar RW, Nichol G, Pandey DK, Paynter NP, Reeves MJ, Sorlie PD, Stein J, Towfighi A, Turan TN, Virani SS, Wong ND, Woo D, Turner MB, American Heart Association Statistics Committee and Stroke Statistics Subcommittee. Heart disease and stroke statistics--2014 update: a report from the American Heart Association. Circulation. 2014 Jan 21;129(3):e28-292. PubMed

Kochanek KD, Murphy SL, Xu J, Arias E. Mortality in the United States, 2013. NCHS Data Brief. 2014 Dec;(178):1-8. PubMed

Extent of Measure Testing

Assessment of Updated Models

The stroke measure estimates hospital-specific 30-day all-cause risk-standardized mortality rates

(RSMRs) using a hierarchical logistic regression model. Refer to Section 2 in the original measure documentation for a summary of the measure methodology and model risk-adjustment variables. Refer to prior methodology and technical reports for further details.

The Centers for Medicare & Medicaid Services (CMS) evaluated and validated the performance of the models, using July 2013 to June 2016 data for the 2017 reporting period. They also evaluated the stability of the risk-adjustment model over the three-year measurement period by examining the model variable frequencies, model coefficients, and the performance of the risk-adjustment model in each year.

CMS assessed logistic regression model performance in terms of discriminant ability for each year of data and for the three-year combined period. They computed two summary statistics to assess model performance: the predictive ability and the area under the receiver operating characteristic (ROC) curve (c-statistic). CMS also computed between-hospital variance for each year of data and for the three-year combined period. If there were no systematic differences between hospitals, the between-hospital variance would be zero.

The results of these analyses are presented in Section 4.6 of the original measure documentation.

Stroke Mortality 2017 Model Results

Frequency of Stroke Model Variables

CMS examined the change in the frequencies of clinical and demographic variables. Frequencies of model variables were stable over the measurement period. The largest changes in the frequencies (those greater than 2% absolute change) include a decrease in Other musculoskeletal and connective tissue disorders (70.4% to 67.1%).

Stroke Model Parameters and Performance

Table 4.6.2 in the original measure documentation shows hierarchical logistic regression model variable coefficients by individual year and for the combined three-year dataset. Table 4.6.3 in the original measure documentation shows the risk-adjusted odds ratios (ORs) and 95% confidence intervals for the stroke mortality model by individual year and for the combined three-year dataset. Overall, the variable effect sizes were relatively constant across years. In addition, model performance was stable over the three-year time period; the c-statistic increased slightly from 0.74 to 0.75.

Refer to the original measure documentation for additional information.

Evidence for Extent of Measure Testing

Yale New Haven Health Services Corporation (YNHHSC), Center for Outcomes Research and Evaluation (CORE). 2017 condition-specific measures updates and specifications report: hospital-level 30-day risk-standardized mortality measures. Baltimore (MD): Centers for Medicare & Medicaid Services (CMS); 2017 Mar. 98 p. [29 references]

State of Use of the Measure

State of Use

Current routine use

Current Use

not defined yet

Application of the Measure in its Current Use

Measurement Setting

Hospital Inpatient

Professionals Involved in Delivery of Health Services

not defined yet

Least Aggregated Level of Services Delivery Addressed

Single Health Care Delivery or Public Health Organizations

Statement of Acceptable Minimum Sample Size

Specified

Target Population Age

Age greater than or equal to 65 years

Target Population Gender

Either male or female

National Strategy for Quality Improvement in Health Care

National Quality Strategy Aim

Better Care

National Quality Strategy Priority

Making Care Safer

Institute of Medicine (IOM) National Health Care Quality Report Categories

IOM Care Need

Getting Better

IOM Domain

Safety

Data Collection for the Measure

Case Finding Period

Discharges July 1, 2013 through June 30, 2016

Denominator Sampling Frame

Patients associated with provider

Denominator (Index) Event or Characteristic

Clinical Condition

Institutionalization

Patient/Individual (Consumer) Characteristic

Denominator Time Window

not defined yet

Denominator Inclusions/Exclusions

Inclusions
An *index admission* is the hospitalization to which the mortality outcome is attributed and includes admissions for patients:

- Having a principal discharge diagnosis of ischemic stroke*
- Enrolled in Medicare Fee-for-Service (FFS) Part A and Part B for the 12 months prior to the date of admission, and enrolled in Part A during the index admission
- Aged 65 or over
- Not transferred from another acute care facility

*International Classification of Diseases, Tenth Revision, Clinical Modification (ICD-10-CM) codes that define the ischemic stroke cohort for discharges on or after October 1, 2015:

I63.00 Cerebral infarction due to thrombosis of unspecified precerebral artery
I63.011 Cerebral infarction due to thrombosis of right vertebral artery
I63.012 Cerebral infarction due to thrombosis of left vertebral artery
I63.019 Cerebral infarction due to thrombosis of unspecified vertebral artery
I63.02 Cerebral infarction due to thrombosis of basilar artery
I63.031 Cerebral infarction due to thrombosis of right carotid artery
I63.032 Cerebral infarction due to thrombosis of left carotid artery
I63.039 Cerebral infarction due to thrombosis of unspecified carotid artery
I63.09 Cerebral infarction due to thrombosis of other precerebral artery
I63.10 Cerebral infarction due to embolism of unspecified precerebral artery
I63.111 Cerebral infarction due to embolism of right vertebral artery
I63.112 Cerebral infarction due to embolism of left vertebral artery
I63.119 Cerebral infarction due to embolism of unspecified vertebral artery
I63.12 Cerebral infarction due to embolism of basilar artery
I63.131 Cerebral infarction due to embolism of right carotid artery
I63.132 Cerebral infarction due to embolism of left carotid artery
I63.139 Cerebral infarction due to embolism of unspecified carotid artery
I63.19 Cerebral infarction due to embolism of other precerebral artery

I63.20 Cerebral infarction due to unspecified occlusion or stenosis of unspecified precerebral arteries
I63.211 Cerebral infarction due to unspecified occlusion or stenosis of right vertebral arteries
I63.212 Cerebral infarction due to unspecified occlusion or stenosis of left vertebral arteries
I63.219 Cerebral infarction due to unspecified occlusion or stenosis of unspecified vertebral arteries
I63.22 Cerebral infarction due to unspecified occlusion or stenosis of basilar arteries
I63.231 Cerebral infarction due to unspecified occlusion or stenosis of right carotid arteries
I63.232 Cerebral infarction due to unspecified occlusion or stenosis of left carotid arteries
I63.239 Cerebral infarction due to unspecified occlusion or stenosis of unspecified carotid arteries
I63.29 Cerebral infarction due to unspecified occlusion or stenosis of other precerebral arteries
I63.30 Cerebral infarction due to thrombosis of unspecified cerebral artery
I63.311 Cerebral infarction due to thrombosis of right middle cerebral artery
I63.312 Cerebral infarction due to thrombosis of left middle cerebral artery
I63.319 Cerebral infarction due to thrombosis of unspecified middle cerebral artery
I63.321 Cerebral infarction due to thrombosis of right anterior cerebral artery
I63.322 Cerebral infarction due to thrombosis of left anterior cerebral artery
I63.329 Cerebral infarction due to thrombosis of unspecified anterior cerebral artery
I63.331 Cerebral infarction due to thrombosis of right posterior cerebral artery
I63.332 Cerebral infarction due to thrombosis of left posterior cerebral artery
I63.339 Cerebral infarction due to thrombosis of unspecified posterior cerebral artery
I63.341 Cerebral infarction due to thrombosis of right cerebellar artery
I63.342 Cerebral infarction due to thrombosis of left cerebellar artery
I63.349 Cerebral infarction due to thrombosis of unspecified cerebellar artery
I63.39 Cerebral infarction due to thrombosis of other cerebral artery
I63.40 Cerebral infarction due to embolism of unspecified cerebral artery
I63.411 Cerebral infarction due to embolism of right middle cerebral artery
I63.412 Cerebral infarction due to embolism of left middle cerebral artery
I63.419 Cerebral infarction due to embolism of unspecified middle cerebral artery
I63.421 Cerebral infarction due to embolism of right anterior cerebral artery
I63.422 Cerebral infarction due to embolism of left anterior cerebral artery
I63.429 Cerebral infarction due to embolism of unspecified anterior cerebral artery
I63.431 Cerebral infarction due to embolism of right posterior cerebral artery
I63.432 Cerebral infarction due to embolism of left posterior cerebral artery
I63.439 Cerebral infarction due to embolism of unspecified posterior cerebral artery
I63.441 Cerebral infarction due to embolism of right cerebellar artery
I63.442 Cerebral infarction due to embolism of left cerebellar artery
I63.449 Cerebral infarction due to embolism of unspecified cerebellar artery
I63.49 Cerebral infarction due to embolism of other cerebral artery
I63.50 Cerebral infarction due to unspecified occlusion or stenosis of unspecified cerebral artery
I63.511 Cerebral infarction due to unspecified occlusion or stenosis of right middle cerebral artery
I63.512 Cerebral infarction due to unspecified occlusion or stenosis of left middle cerebral artery
I63.519 Cerebral infarction due to unspecified occlusion or stenosis of unspecified middle cerebral artery
I63.521 Cerebral infarction due to unspecified occlusion or stenosis of right anterior cerebral artery
I63.522 Cerebral infarction due to unspecified occlusion or stenosis of left anterior cerebral artery
I63.529 Cerebral infarction due to unspecified occlusion or stenosis of unspecified anterior cerebral artery
I63.531 Cerebral infarction due to unspecified occlusion or stenosis of right posterior cerebral artery
I63.532 Cerebral infarction due to unspecified occlusion or stenosis of left posterior cerebral artery
I63.539 Cerebral infarction due to unspecified occlusion or stenosis of unspecified posterior cerebral artery
I63.541 Cerebral infarction due to unspecified occlusion or stenosis of right cerebellar artery
I63.542 Cerebral infarction due to unspecified occlusion or stenosis of left cerebellar artery
I63.549 Cerebral infarction due to unspecified occlusion or stenosis of unspecified cerebellar artery
I63.59 Cerebral infarction due to unspecified occlusion or stenosis of other cerebral artery
I63.6 Cerebral infarction due to cerebral venous thrombosis, nonpyogenic
I63.8 Other cerebral infarction
I63.9 Cerebral infarction, unspecified
I67.89 Other cerebrovascular disease

Note: International Classification of Diseases, Ninth Revision (ICD-9) code lists for discharges prior to October 1, 2015 can be found in the *2016 Condition-specific Mortality Measures Updates and Specifications Report* .

Exclusions

Inconsistent or unknown vital status or other unreliable demographic (age and gender) data
Enrolled in the Medicare hospice program any time in the 12 months prior to the index admission, including the first day of the index admission
Discharged against medical advice

For patients with more than one eligible admission for stroke in a given year, only one index admission for that condition is randomly selected for inclusion in the cohort. Additional admissions within that year are excluded.

Exclusions/Exceptions

not defined yet

Numerator Inclusions/Exclusions

Inclusions
The measure counts death from any cause within 30 days of the start of the index admission.

The risk-standardized mortality rate (RSMR) is calculated as the ratio of the number of "predicted" deaths to the number of "expected" deaths at a given hospital, multiplied by the national observed mortality rate. For each hospital, the numerator of the ratio is the number of deaths within 30 days predicted based on the hospital's performance with its observed case mix.

Note: This outcome measure does not have a traditional numerator and denominator like a core process measure; thus, this field is used to define the outcome.

See the *2017 Condition-specific Measures Updates and Specifications Report. Hospital-level 30-day Risk-standardized Mortality Measures* for more details.

Exclusions
Unspecified

Numerator Search Strategy

Institutionalization

Data Source

Administrative clinical data

Type of Health State

Death

Instruments Used and/or Associated with the Measure

None

Computation of the Measure

Measure Specifies Disaggregation

Does not apply to this measure

Scoring

Rate/Proportion

Interpretation of Score

Desired value is a lower score

Allowance for Patient or Population Factors

not defined yet

Description of Allowance for Patient or Population Factors

Risk-Adjustment Variables

In order to account for differences in case mix among hospitals, the measure adjusts for variables (for example, age, comorbid diseases, and indicators of patient frailty) that are clinically relevant and have relationships with the outcome. For each patient, risk-adjustment variables are obtained from inpatient, outpatient, and physician Medicare administrative claims data extending 12 months prior to, and including, the index admission.

The measure adjusts for case mix differences among hospitals based on the clinical status of the patient at the time of the index admission. Accordingly, only comorbidities that convey information about the patient at that time or in the 12 months prior, and not complications that arise during the course of the hospitalization, are included in the risk adjustment.

The measure does not adjust for socioeconomic status (SES) because the association between SES and health outcomes can be due, in part, to differences in the quality of healthcare that groups of patients with varying SES receive. The intent is for the measures to adjust for patient demographic and clinical characteristics while illuminating important quality differences.

Refer to Appendix D of the original measure documentation for the list of comorbidity risk-adjustment variables and the list of complications that are excluded from risk adjustment if they occur only during the index admission.

Standard of Comparison

not defined yet

Identifying Information

Original Title

Hospital-level 30-day RSMR following ischemic stroke.

Measure Collection Name

National Hospital Inpatient Quality Measures

Measure Set Name

Mortality Measures

Submitter

Centers for Medicare & Medicaid Services - Federal Government Agency [U.S.]

Developer

Centers for Medicare & Medicaid Services - Federal Government Agency [U.S.]

Yale-New Haven Health Services Corporation/Center for Outcomes Research and Evaluation under contract to Centers for Medicare & Medicaid Services - Academic Affiliated Research Institute

Funding Source(s)

Centers for Medicare & Medicaid Services (CMS)

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This measure was developed by a team of clinical and statistical experts:

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Financial Disclosures/Other Potential Conflicts of Interest

None

Measure Initiative(s)

Hospital Compare

Hospital Inpatient Quality Reporting Program

Adaptation

This measure was not adapted from another source.

Date of Most Current Version in NQMC

2017 Mar

Measure Maintenance

Annual

Date of Next Anticipated Revision

2018 Apr

Measure Status

This is the current release of the measure.

This measure updates a previous version: Specifications manual for national hospital inpatient quality measures, version 5.0b. Centers for Medicare & Medicaid Services (CMS), The Joint Commission; Effective 2015 Oct 1. various p.

Measure Availability

Source available from the QualityNet Web site .

Check the QualityNet Web site regularly for the most recent version of the specifications manual and for the applicable dates of discharge.

Companion Documents

The following are available:

Hospital compare: a quality tool provided by Medicare. [internet]. Washington (DC): U.S. Department of Health and Human Services; [accessed 2017 Oct 3]. This is available from the Medicare Web site

.

Yale New Haven Health Services Corporation (YNHHSC), Center for Outcomes Research and Evaluation (CORE). 2017 Medicare hospital quality chartbook. Baltimore (MD): Centers for Medicare & Medicaid Services (CMS); 2017. Available from the Centers for Medicare & Medicaid Services (CMS) Web site .

Yale New Haven Health Services Corporation (YNHHSC), Center for Outcomes Research and Evaluation (CORE). 2017 condition-specific mortality measures updates and specifications report: supplemental ICD-10 code lists for use with claims for discharges on or after October 1, 2015. Baltimore (MD): Centers for Medicare & Medicaid Services (CMS); 2017. Available from the QualityNet Web site .

NQMC Status

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Copyright Statement

Production

Source(s)

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